

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



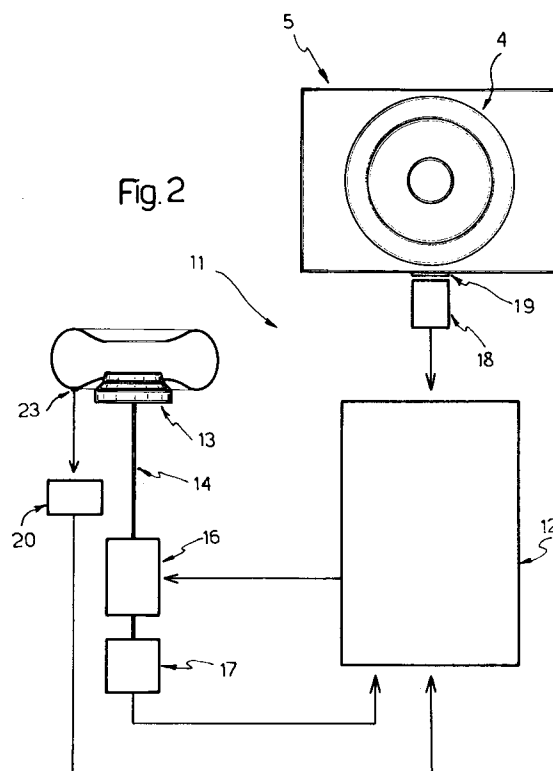
(51) Publication number:

0 492 170 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **91120336.2**(51) Int. Cl.⁵: **B29D 30/06, B29D 30/00**(22) Date of filing: **27.11.91**(30) Priority: **21.12.90 IT 6804390**(43) Date of publication of application:
01.07.92 Bulletin 92/27(84) Designated Contracting States:
DE ES FR GB IT(71) Applicant: **Bridgestone Corporation**
10-1, Kyobashi 1-Chome Chuo-Ku
Tokyo 104(JP)(72) Inventor: **Cristofano, Marino**
Via Silvio Pellico, 41/B
I-00040 Pomezia(IT)
Inventor: **Minaudo, Diego**
Via Aristarco di Samotracia, 10
I-00125 Roma(IT)(74) Representative: **Jorio, Paolo et al**
Studio Torta, Via Viotti, 9
I-10121 Torino(IT)(54) **Method for the vectorial assembly of green tires in a curing mold.**

(57) A method for the vectorial assembly of green tires (2) in a curing unit (4), whereby a processing unit (12), after performing a first stage consisting in determining the origin of a tire (2), i.e. the machine by which it was produced, and the curing unit (4) in which it is to be cured, extracts memorised data relative to the dissymmetry of the curing unit (4) and the average tire (2) produced on the machine, and positions the tire (2) angularly in relation to the curing unit (4) so as to compensate for both dissymmetries according to a given program.

**EP 0 492 170 A1**

The present invention relates to a method for the vectorial assembly of green tires in a curing mold. In recent times, the tire manufacturing industry has registered a substantial breakthrough in eliminating both radial and axial dissymmetry. In actual practice, however, a tire with substantially no axial or radial dissymmetry vectors must naturally be considered a purely random achievement in that, like any machine, a green tire manufacturing machine inevitably introduces predominantly systematic errors, mainly due to the geometry of the machine and the type of operation being performed.

Regardless of the machine, however, it is usually possible to detect statistically a definite radial or axial dissymmetry vector characterising, on average, substantially all the tires produced by the same machine.

What is more, the curing mold to which the tire is usually assigned in purely random manner also presents a dissymmetry marked by a definite vector and responsible for yet a further manufacturing error.

The aim of the present invention is to provide a method of assembling green tires in curing molds, in such a manner as to minimise the dissymmetry detectable in the cured tire.

With this aim in view, according to the present invention, there is provided a method for the vectorial assembly of green tires in a curing unit, characterised by the fact that it comprises a first stage performed by a processing unit for determining both the origin of said green tire, i.e. the machine on which it was produced, and the curing unit to which it is assigned; a second stage wherein said processing unit extracts memorised data relative to the dissymmetry of both said curing unit and the average tire produced by said machine; and a third stage wherein said tire is positioned angularly inside said curing unit in such a manner as to compensate at least partially for said dissymmetries according to a given program on said processing unit.

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a view in perspective of a device for feeding and assembling tires inside a curing mold and implementing the method according to the present invention;

Fig.2 shows a schematic, partial block diagram of part of the Fig.1 device.

Number 1 in Fig.1 indicates a device for feeding green tires 2 into a station 3 for opening and closing curing units 4 fed successively into station 3 on respective carriages 5 traveling along a line 6 extending through station 3.

Curing units 4 are preferably of the type de-

scribed and illustrated in USA Patent n. 4,747,765, the content of which is incorporated fully herein in the interest of full disclosure.

Device 1 comprises an input conveyor 7 located between station 3 and a machine (not shown) for forming tires 2. In particular, conveyor 7 comprises a conveyor belt 8 for feeding tires 2 on to a roller conveyor 9 to the side of station 3 and supported at a given height on a base frame 10.

Roller conveyor 9 is assigned a tire positioning unit 11, a block diagram of which is shown in Fig.2. With reference to Fig.2, positioning unit 11 comprises a processing unit 12, normally consisting of an electronic computer designed to memorise the radial and axial dissymmetry vectors of both the average tire produced on each of the machines (not shown) connected to conveyor 8, and each curing unit 4 assignable to station 3.

Unit 11 also comprises a substantially truncated-cone-shaped platform 13 fitted on to the top end of a shaft 14 designed to move axially, by virtue of a linear actuator 14a (Fig.1) and through an opening 15 formed in roller conveyor 9, between a lowered idle position, wherein platform 13 is at most on a level with roller conveyor 8, and a raised operating position wherein platform 13 is located over roller conveyor 9. Shaft 14 is connected to the output of a preferably step type motor 16 for rotating platform 13 about its axis by angles measurable by an encoder 17 connected to shaft 14.

Unit 12 presents a first reader 18 for reading an identification plate 19 on each carriage 5 and relative to the curing unit 4 carried on the same. Reader 18 thus provides for transmitting to unit 12 information for identifying said unit 4, and so enabling unit 12 to assign a respective memorised radial and axial dissymmetry vector to each unit 4 entering station 3. Unit 12 also presents a second reader 20, consisting of a photocell, located, on the Fig.1 device, on the end of an arm 21 designed, via a linear actuator 22, to move reader 20 radially in relation to shaft 14 and to and from a reading position wherein reader 20 faces the lower lateral wall of a tire 2 located on platform 13 in the raised operating position.

Reader 20 provides for reading an identification marker 23 located, in the example shown, on the lower lateral wall of each tire 2 and indicating its "origin", i.e. the machine (not shown) by which tire 2 was produced. Reader 20 thus provides for transmitting to unit 12 information for identifying the "origin" of each tire 2, and so enabling unit 12 to assign a memorised mean radial and axial dissymmetry vector to each tire 2 raised on platform 13.

In actual use, as each tire 2 is fed along conveyor 7, it is examined and its "origin" determined by reader 20. In the example shown, said

"origin" is determined when tire 2, upon reaching opening 15, is raised on platform 13 and rotated about the axis of shaft 14 so as to feed marker 23 past reader 20 in the reading position. Upon reading marker 23, reader 20 supplies unit 12 with a signal enabling it to retrieve, from memorised mean radial and axial dissymmetry vectors, those relative to tire 2 in question, and the position of these vectors in relation to an origin which is shifted by a given angle, possibly zero, in relation to the position of marker 23. At the same time, reader 18 has identified a unit 4 fed into station 3 to receive tire 2 in question, and enabled unit 12 to retrieve, from memorised mean radial and axial dissymmetry vectors, those relative to said unit 4, and the position of these vectors in relation to an origin located at a given point along unit 4.

Supplied with the above data, unit 12 provides for determining, according to a given program, the angle by which tire 2 must be rotated, commencing from the position wherein marker 23 is arranged facing reader 20, for it to be loaded inside unit 4 at such an angle as to enable the production of a finished tire 24 in which the dissymmetry of tire 2, on the one hand, and respective unit 4, on the other, is at least partially compensated on the basis of minimum functions dictated by said program.

Angular positioning of tire 2 as required by platform 13 is controlled in known feedback manner by encoder 17. Once rotated into the required position, tire 2 is gripped by a transfer device 25 and loaded into open unit 4 in station 3.

Both device 25 and station 3 may be designed in various ways. In the Fig.1 example, station 3 is similar to the one described and illustrated in USA Patent n.4,728,274, the content of which is fully incorporated herein in the interest of full disclosure.

Station 3 is defined by a gantry type structure 26 having a top wall 27 supporting a mechanism 27a for lifting the upper half mold 28 of unit 4, and a pillar 29 supporting a transverse slideway 30 of device 25. In the example shown, device 25 also comprises a slide 31 traveling along slideway 30 and supporting a further slideway 32 perpendicular to slideway 30 and fitted with a further slide 33 supporting an arm 34 connected at its free end to a known pickup head 35 for tires 2. Device 25 is so arranged as to move head 35 between a pickup position coaxial with tire 2 on conveyor 7, and a release position over and coaxial with the lower half mold 36 of unit 4 in station 3.

In the example shown, station 3 also presents an unloading platform 37 designed to move between an idle position outside structure 26, and an operating position between open half molds 28 and 36.

In actual use, on entering station 3, each unit 4 is opened by lifting off upper half mold 28 to which

finished tire 24 is initially connected. Once unit 4 has been opened, platform 37 is moved in between half molds 36 and 28 to receive tire 24, which is detached in known manner from half mold 28 by device 27a. At the same time, head 35 grips a tire 2 set to the required angular position by unit 11, and feeds it, still in this position, into half mold 36. Platform 37 is then extracted from structure 26 to enable closure of unit 4 and commencement of the next curing cycle.

Claims

1. A method for the vectorial assembly of green tires (2) in a curing unit (4), characterised by the fact that it comprises a first stage performed by a processing unit (12) for determining both the origin of said green tire (2), i.e. the machine on which it was produced, and the curing unit (4) to which it is assigned; a second stage wherein said processing unit (12) extracts memorised data relative to the dissymmetry of both said curing unit (4) and the average tire (2) produced by said machine; and a third stage wherein said tire (2) is positioned angularly inside said curing unit (4) in such a manner as to compensate at least partially for said dissymmetries according to a given program on said processing unit (12).
2. A method as claimed in Claim 1, characterised by the fact that the origin of each said green tire (2) is determined by reading a marker (23) affixed to said tire (2) during manufacture.
3. A method as claimed in Claim 1 or 2, characterised by the fact that said angular positioning is performed by supporting said tire (2) on a platform (13) rotated about its axis by a motor (16) controlled by said processing unit (12), and is feedback-controlled via an encoder (17).

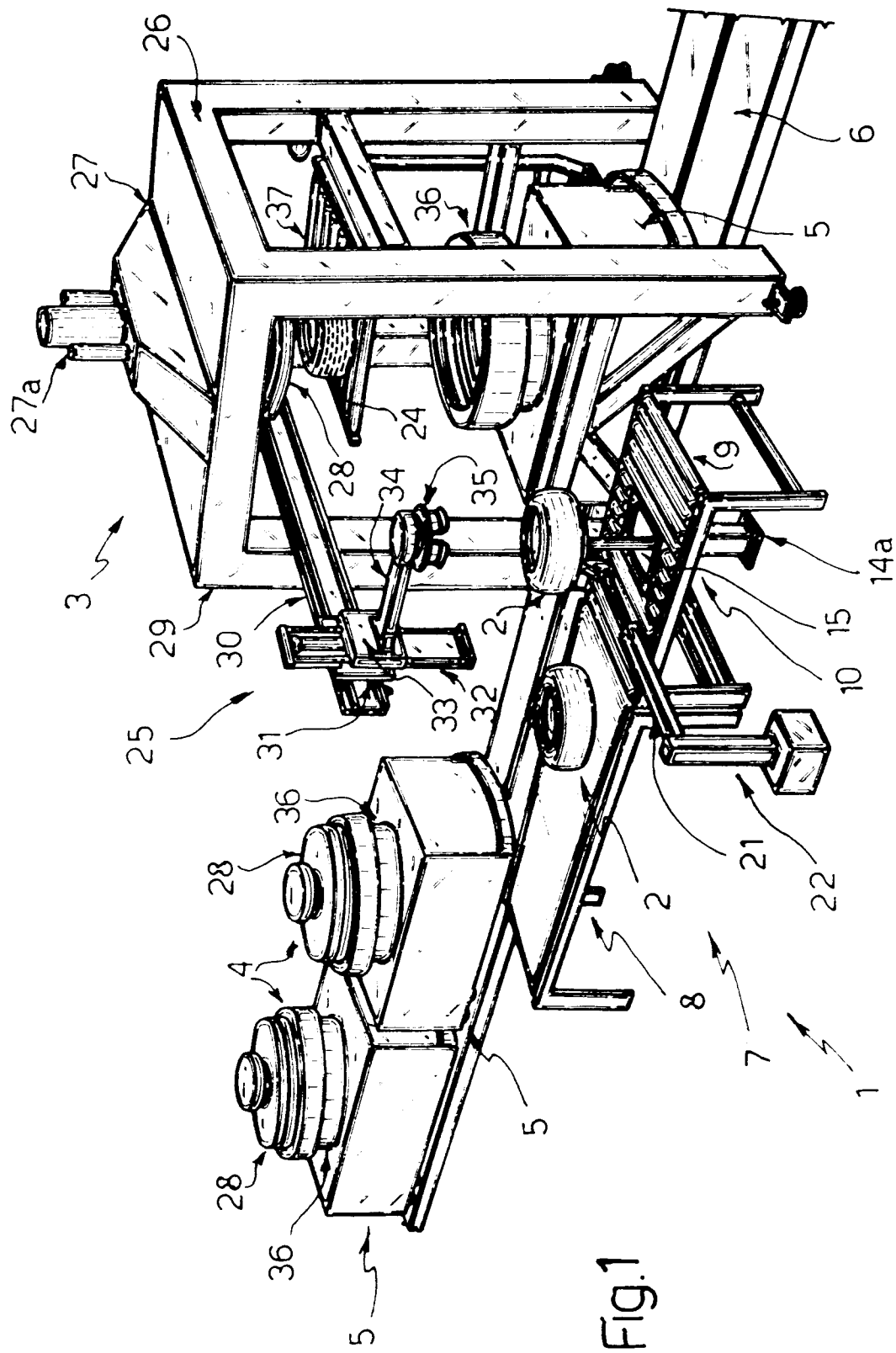
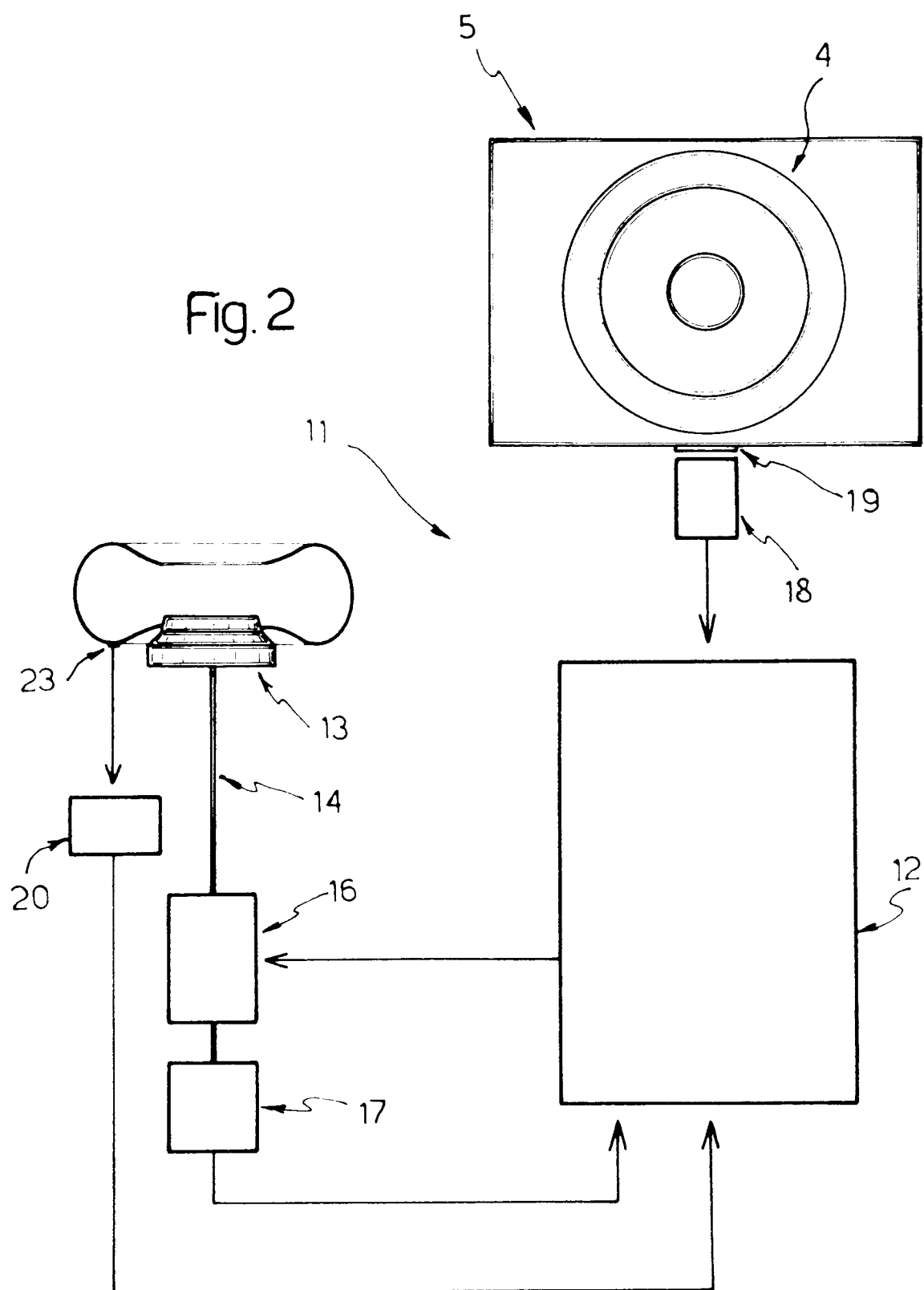


Fig.1

Fig. 2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 12 0336

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	WORLD PATENTS INDEX LATEST Section Ch, Week 875D, Derwent Publications Ltd., London, GB; Class A, AN 87-352512 & JP-A-62 256 613 (BRIDGESTONE TIRE K.K.) 9 November 1987 * abstract and fig. 1-9 * ---	1	B29D30/06 B29D30/00
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 33 (M-452)(2090) 8 February 1986 & JP-A-60 187 539 (KAWATSUNE SHIYOUTEN K. K.) 25 September 1985 * abstract and figures * ---	1,2	
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 92 (M-468)(2149) 9 April 1986 & JP-A-60 230 835 (BRIDGESTONE K.K.) 16 November 1985 * abstract and figures * ---	1	
A,D	US-A-4 747 765 (K. J. SIEGENTHALER ET AL.) & EP-A-0 246 495 (THE FIRESTONE TIRE & RUBBER CO.) * the whole document * -----	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B29D G05B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 MARCH 1992	Examiner FREGOSI A.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			